ENVIRONMENTAL LEGISLATIVE & REGULATORY ADVOCACY PROGRAM
OF THE CALIFORNIA PAINT & COATINGS INDUSTRY ALLIANCE

July 31, 1998

Jim Behrman
Manager, Strategy Evaluation Section
California Air Resources Board
P.O. Box 2815
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Dear ~~Mr. Behrman~~ Jim:

EL RAP is the Environmental Legislative & Regulatory Advocacy Program of the California Paint & Coatings Industry Alliance. Our members are primarily smaller and local or regional paint manufacturers, dealers, and contractors who make, sell, and use a major share of the architectural coatings in California. Other members include suppliers of raw materials, equipment, and services to the industry, and organized labor.

Recently, following informal discussions with representatives of several California air quality regulatory agencies, EL RAP formed a special Task Force to develop a concept paper exploring innovative approaches to regulating architectural coatings. Enclosed is a copy of the final concept paper.

We believe that implementing any or all of the innovative approaches described in this paper would greatly improve the efficiency and cost-effectiveness of architectural coatings regulation. We look forward to having an opportunity to discuss these innovative approaches with your agency. In the meantime, if you have any questions, please feel free to call me at 1-800-537-4098.

Very truly yours,

EL RAP

Robert Wendoll
Chairman

(Enclosure)

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INNOVATIVE APPROACHES TO REGULATING ARCHITECTURAL COATINGS

July 24, 1998

An Informal Concept Paper
Prepared by the
EL RAP Rule 1113 Task Force

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I. INTRODUCTION

Ground-level ozone has proved to be one of the most persistent urban and regional air pollution problems in the United States, mostly because of the complexity of its formation and control. Ozone (O_3, the triatomic molecular form of oxygen) is not emitted directly to air, but forms in the lower atmosphere through the action of sunlight on nitrogen dioxide (NO_2), with nitric oxide (NO) as a by-product. Reactive volatile organic compounds (VOC) facilitate ozone accumulation by reacting with hydroxyl radicals (OH) to form organic peroxy radicals that can oxidize NO to regenerate NO_2. Thus, VOC emissions can increase the rate at which ozone is formed from nitrogen oxides (NO_x, which is the sum of NO and NO_2), allowing higher concentrations to form before the NO_x can be diluted and removed from the atmosphere. The degree of this rate-increasing effect (also known as "reactivity") depends, in part, on the amount and kind of VOC emitted, the amount of NO_x present, the resulting VOC-to-NO_x ratio, and meteorological conditions—intense sunlight and heat drive ozone formation.

The amount of NO_x in the atmosphere is more than 90% man-made through combustion—primarily the burning of fossil fuels in motor vehicles and electric power plants—and is therefore most concentrated in and near urban areas. Atmospheric VOC is abundant and widespread over the continental United States, since about 60% comes from natural sources—mostly trees and vegetation—while the remaining 40% is emitted from man-made sources including motor vehicle exhaust, gasoline evaporation, and solvent use. In general, the amount of NO_x emitted ultimately determines <u>how much</u> ozone will form, while the amount, kind, and distribution of VOC determine <u>where</u> ozone will form. VOC emission controls have proven effective at marginally reducing peak ozone levels in urban areas (in the relative absence of NO_x controls), while simultaneously increasing average ozone levels regionally. In other words, the major effect of reducing man-made

VOC emissions is to shift the location of ozone formation downwind from NO_x-emitting urban centers, which may reduce population-weighted exposures to peak ozone levels.

Architectural coatings—housepaints and other coatings applied to residential, commercial, industrial, and institutional buildings and stationary structures of all kinds—generally contain organic solvents that are classified for regulatory purposes as VOC. In current "emissions inventories," the amount of VOC emissions attributed to architectural coatings is variously estimated at two to four percent of total atmospheric VOC. Such estimates, however, are not consistent with ambient monitoring data, which show substantially lower concentrations. Because of the low volatility and reactivity of many organic compounds used in architectural coatings, serious scientific uncertainties remain as to whether, or to what extent and under what conditions, architectural coating VOC emissions may contribute significantly to ozone formation. Nevertheless, for more than 20 years in California, air pollution control authorities have regulated architectural coatings as a part of efforts to control ozone levels.

Over the past quarter century, our scientific understanding of the ozone formation process has developed considerably; likewise, important market-driven advances in coatings technology have occurred. Remarkably, the basic regulatory strategy applied to architectural coatings has remained unchanged, and unverified as to its effectiveness. That strategy consists of setting limits on the amount of VOC solvent that coatings may contain, and banning any products that exceed the limits. Many paint industry experts believe that the rules implementing this strategy have long since exceeded the limits of its effectiveness, as the strategy is founded upon two inherently flawed assumptions. First, it is assumed that forcing the substitution of products containing less solvent—in place of coatings with higher solvent content—must necessarily reduce total VOC emissions from the use of architectural coatings. Second, it is assumed that reducing total VOC emissions from the use of architectural coatings must necessarily reduce peak ozone levels.

The first assumption is invalid because higher-VOC coatings are often the best products for specific uses; banning the best products available will only promote the substitution of less adequate alternatives. For a variety of reasons, using these lower-VOC alternatives can result in greater volume of coating usage per application, more solvent-thinning of coatings in the field, and increased frequency of re-application. The net result is that substitution of lower-VOC alternatives often causes an increase in total VOC emissions from the use of architectural coatings. The second assumption is invalid because the ozone impacts of VOC emissions will depend not only on the amount of VOC emitted, but also on the kind of VOC and the environmental conditions present. Equal amounts of different kinds of VOC may result in very unequal ozone levels, because VOC reactivities are highly variable under certain environmental conditions. Banning coatings solely on the basis of VOC content can have unintended impacts on the character and timing of VOC emissions, causing more reactive VOC to be used in place of less reactive VOC, and more emissions to occur at times when weather conditions promote ozone formation. The net result is that a reduction in the total amount of VOC emissions from the use of architectural coatings could nevertheless cause an increase in peak ozone levels.

Based on 20 years of experience with architectural coating regulations, and with greater scientific knowledge of ozone formation processes available today, we believe that more efficient and cost-effective regulatory strategies can be developed to minimize any potential ozone formation impacts that may result from architectural coating VOC emissions. Additional new information to support innovative approaches should be available shortly. The California Air Resources Board (CARB) recently conducted a statewide survey of architectural coatings, collecting for the first time speciated VOC content data to identify the kinds of VOC used in coatings. This survey will provide a much-needed update to previous surveys, since the most recent was conducted for coatings distributed in 1990. A final report on the new survey is expected to be released by the end of 1998. Also, the South Coast Air Quality Management District (SCAQMD) is sponsoring a performance assessment study of products in various selected architectural coating categories, across the full range of VOC content levels. Industry representatives, including EL RAP, are participating in a Technical Advisory Committee to help design and oversee the study. A final report on this study should be available early in 1999. While it would be advisable to wait for the results of both the survey and study before implementing any new regulatory strategies for architectural coatings, we can identify several promising innovative approaches worth considering. A discussion of these innovative approaches follows.

II. INNOVATIVE APPROACHES

A. REACTIVITY-BASED STANDARDS

CONCEPT: Design regulatory standards to account for differences in VOC reactivity (i.e., ability to accelerate ozone formation) so that products meeting the same limit can be expected to have equal ozone impacts, under a given set of environmental conditions.

DISCUSSION: Current mass-based VOC content standards do not provide reliable indications of the potential ozone impacts of architectural coatings. For example: Two coatings might be formulated at the same VOC content level, but with different solvents—one containing only xylenes, and the other containing only mineral spirits. The ozone impacts of the first coating would be more than 10 times greater than those of the second coating, because of differences in VOC reactivities (under "maximum incremental reactivity" conditions). A better "VOC impact" calculation method would take into account both mass and reactivity of component solvents, beyond the current practice of exempting designated "negligibly reactive" VOC. CARB already employs "reactivity adjustment factors" in its alternative fuels regulation, and is now proposing to incorporate a reactivity-based voluntary compliance option in its statewide aerosol coatings rule. To support this proposal, CARB has sponsored extensive research on quantifying reactivities of common solvents and aerosol propellants. Much of that research should be transferable to architectural coating regulation.

m-xyl 11.06
10x

One area of potential concern, however, is that reactivity values are dependent on environmental conditions. As air quality continues to improve with declining NO_x levels (and increasing VOC/NO_x ratios), VOC incremental reactivities drop toward zero, or actually become negative (i.e., an incremental VOC increase suppresses ozone formation). Careful monitoring of changing conditions will be necessary to fine-tune reactivity adjustment factors and to assess overall rule effectiveness.

RECOMMENDATION: Although some additional research may be needed to characterize reactivities of the full range of solvents used in coatings, existing architectural coating regulations can be amended in the near-term to allow reactivity data to be utilized as soon as it becomes available. We recommend that rules be amended to incorporate a "VOC impact" calculation method using reactivity adjustment factors, with an initial placeholder value of "one" assigned to all reactive VOC until better data is available.

B. PERFORMANCE-BASED STANDARDS

CONCEPT: Design regulatory standards that reflect actual emissions resulting from architectural coating applications, taking into consideration those performance characteristics that determine coverage and durability.

DISCUSSION: Current mass-based VOC content standards do not provide reliable indications of the emission potentials of architectural coatings. For example: Two coatings might be formulated at the same VOC content level, but with different coverage characteristics—one is a high-build coating that produces a dry film thickness of 5 mils, and the other is a conventional coating that produces a dry film thickness of 2 mils. The first coating will emit more than twice as much VOC per unit of area coated, compared to the second coating. Also, performance impacts can be compounded with reactivity impacts. In the previous example given in the discussion of reactivity-based standards, it was assumed that the coatings would be applied at the same rate of coverage. If, in fact, both of these examples dealt with the same pair of coatings (i.e., one a high-build coating containing only xylenes, the other a conventional coating with only mineral spirits), the ozone impacts of the first would be more than 20 times greater than the second, even though both have the same level of VOC content.

Durability is an equally important performance characteristic, expressed as service life (i.e., the average interval between successive re-applications). For example: Two coatings may be formulated at the same VOC content level, but with markedly different durability characteristics under certain exposure conditions—one has a projected service life of 3 to 5 years, and the other has a projected service life of 7 to 10 years. Over time, through a series of re-application cycles, the first coating would emit twice as much VOC as the more durable second coating. In real-world applications, of course, service life may be variable but can nevertheless be quantified for regulatory purposes by means of a standardized test protocol involving those qualities that most contribute to long-term durability (e.g., adhesion, hardness, abrasion resistance, soil release and stain resistance, color retention, weatherability, moisture and chemical resistance, and corrosion resistance). A precedent exists in U.S. EPA's motor vehicle fuel efficiency ratings, which are determined in a standardized test. Actual mileage may vary, but the ratings are a valuable tool for comparing the relative fuel efficiency of different vehicles.

Again, durability effects in the example above can be compounded with the coverage and reactivity effects described earlier. In that case, long-term ozone impacts of the first coating would be more than 40 times greater than those of the second coating, despite having the same VOC content level. Both coverage and durability are important considerations in reducing total ecological impacts of coatings, from production through distribution to end-use. Life-cycle analysis suggests that formulating coatings to maximize coverage and durability will help to minimize raw material and energy consumption, hazardous waste generation, solid waste disposal, and incidental impacts on water quality as well as air quality.

RECOMMENDATION: Develop a new form of standards and "VOC impact" calculation method to reflect performance impacts on VOC emissions. In the near-term, amend rules to express the mass-based component of standards as VOC emissions per unit of area coated, rather than VOC content per volume of coating. Begin a study project to establish a standardized test protocol for quantifying durability impacts.

C. EXEMPTION OF LOW VOLATILITY COMPOUNDS

CONCEPT: Atmospheric studies suggest that some organic compounds are insufficiently volatile to contribute significantly to ozone formation. Regulations restricting the use of such compounds can achieve little or no air quality benefit, but may hinder development of coatings with lower potential ozone impacts.

DISCUSSION: Major discrepancies exist between regulatory agency "emissions inventories" and actual ambient air monitoring data, with respect to architectural coating VOC emissions. For example: According to the SCAQMD emissions inventory, architectural coatings contribute approximately 4% of total VOC emissions (including biogenic VOC from trees and vegetation) within the South Coast Air Basin. A recent monitoring and source apportionment study (conducted at different times of day at eight locations throughout the South Coast Air Basin) found, however, that the concentration of VOC attributable to architectural coatings was an average of only 0.2%, or about one-twentieth of the amount predicted in the SCAQMD emission inventory. This discrepancy may be due in part to underestimation of emissions from other sources in the inventory, but also to overestimation of emissions from architectural coatings.

Many of the organic compounds used in architectural coatings have low degrees of atmospheric availability, although they are counted as part of the VOC content of coatings. (Emissions inventory estimates are based on surveys of VOC content.) Because of their physical and chemical properties, including low rates of evaporation, these compounds do not disperse widely enough nor remain in the atmosphere long enough to participate in ozone formation to any significant extent. Typically, these compounds may be absorbed by building surfaces, pavement, soil, or vegetation; or they may be subtracted from the air through interaction with water vapor, dust, or other particulate matter.

A useful surrogate for atmospheric availability is volatility, measured as vapor pressure. Consumer product regulations in several states, including California, specify a VOC vapor pressure threshold of 0.1 mm Hg @ 20° C. Compounds with vapor pressures at or below that threshold are exempt from regulation. U.S. EPA recently included the same threshold in its proposed national rule for consumer products, noting in a report to Congress that such "products often contain ingredients which are of extremely low volatility (i.e., some ingredients evaporate at such a low rate that they do not enter the air to any appreciable degree)."

LVP Among the low volatility compounds used in architectural coatings are the principal cosolvents in waterborne latex coatings (e.g., ethylene glycol, propylene glycol, and Texanol ester alcohol). Exempting these compounds would reduce the emissions inventory for architectural coatings by approximately 30%. More important, exemption would provide the formulating latitude necessary to continue development of high-performing waterborne coatings. This development process is an essential prerequisite to sustaining the historically market-driven conversion from higher-VOC solventborne coatings to lower-VOC waterborne coatings, which will further reduce both emissions and potential ozone impacts.

RECOMMENDATION: To better focus control efforts and to promote development of high-performing waterborne coatings, amend existing architectural coating rules, in the near-term, to exempt from regulation those organic compounds that are insufficiently volatile to contribute significantly to ozone formation (as determined by having vapor pressures at or below 0.1 mm Hg @ 20° C).

D. SIMPLIFIED PRODUCT LINE AVERAGING

CONCEPT: Establishing regulatory standards not as absolute limits but as production-weighted averages (applicable to all of a manufacturer's products aggregately in a given category) would provide needed flexibility and allow reductions or reformulations to be made wherever most feasible technologically and economically.

DISCUSSION: A tremendous variety of architectural coatings is available today. For regulatory purposes, coatings are grouped (generally on the basis of end-use similarities) into a number of "categories" with a maximum allowable limit assigned to each category. Any coating that exceeds the applicable limit is banned. These categories, however, are essentially arbitrary constructs that often consolidate coatings that differ widely in their composition, performance, specific end-use, and VOC content. The higher-VOC coatings banned in each category tend to be more specialized (often low volume) products for which no fully adequate alternatives may exist. To preserve these valuable products while achieving equivalent reductions in VOC content (or VOC emissions, or VOC impacts on peak ozone levels, depending on the form of standards), manufacturers could be offered the option of meeting categorical limits that are set as production-weighted averages rather than absolute maximum allowable limits. A manufacturer's categorical average would be calculated as the sum of the volumes of coatings multiplied by their respective VOC values (contents, emissions, or impacts), divided by the total volume of the coatings produced in a given category over some averaging period. As a voluntary alternative compliance option, categorical average limits would create flexibility by allowing manufacturers to make reductions across the range of products in a category, or in multiple categories, wherever reductions can be made most efficiently and cost-effectively. (To ensure equivalent reductions, the average limit may need to be set at a level that is discounted by some percentage—say, for example, ten percent—below the absolute limit for the category.)

U.S. EPA again provides a precedent in its motor vehicle regulations. An automobile manufacturer is allowed to fall short of fuel efficiency standards in some portion of its production in a given vehicle class so long as a "fleet average" is met. SCAQMD Rule 1113 includes an averaging provision for Flat Coatings, but that provision is unfortunately modeled after CARB's consumer product "Alternative Compliance Plan," which is so complex, burdensome, and unpredictable as to outcomes that only two or three manufacturers have ever attempted to make use of it during the many years it has been available. The fundamental defect of these averaging plans is that they are tied to distribution rather than production. Owing to the multiplicity of distribution channels for architectural coatings (and other consumer products), manufacturers may have little control over distribution, and even less over market demand. Any viable product line averaging method must, instead, be tied to what the manufacturer can control, (i.e., production, not distribution, sales, or use). The assumption will have to be made that a manufacturer's production is ultimately distributed proportionately to population.

RECOMMENDATION: Amend architectural coating rules to include a voluntary option for categorical production-weighted averaging. We envision that a manufacturer electing this option would notify the appropriate regulatory agencies of its intention, label all of its products in any category subject to averaging to indicate compliance with the categorical average limit, and file an annual report to substantiate compliance. (Complete production records would be made available for inspection upon request.) The manufacturer must be allowed to opt out of averaging, at the end of each averaging period, at its own discretion.

E. SEASONAL DEREGULATION

CONCEPT: High ozone levels can form only during a limited period in the annual cycle, an "ozone season" that roughly coincides with summer. VOC regulations operating at other times of year have no beneficial effect on ozone, but may be counterproductive to reducing peak ozone levels during summer. A more efficient alternative would be to restrict the operation of VOC regulations to target emissions that occur in the ozone season.

DISCUSSION: Architectural coating regulations currently ban coatings year-round, including products that would perform better than complying alternatives during cooler, wetter seasons when ozone is not a problem. This situation tends to shift more painting work to the warmer, drier summer season when high ozone levels can form. Greater reductions in potential ozone impacts of architectural coatings could be achieved through deregulation during non-ozone season, thereby encouraging more coating operations to be undertaken during fall, winter and spring. The effectiveness of regulation in the summer ozone season would be multiplied by promoting a new avenue for achieving reductions. Under present arrangements, reductions are projected to occur solely from substitution of lower-VOC coatings for higher-VOC coatings; under seasonal deregulation, additional reductions would result from voluntarily deferring some amount of painting work out of summer and into other seasons.

A very limited application of the seasonal approach already exists in SCAQMD Rule 1113, which allows some VOC-thinning of acetone lacquers during a specified period of each year. Also, CARB motor vehicle fuel regulations seasonally require oxygenated fuels to reduce wintertime carbon monoxide levels. A viable, effective, broad-based application of the seasonal approach to architectural coating regulation would require three elements: complete seasonal deregulation during non-ozone season, technologically and economically feasible regulation during ozone season, and minimal administrative requirements. Each of these elements is discussed more fully below.

Complete seasonal deregulation means the seasonal release from any requirements affecting the formulation or use of architectural coatings. Such requirements necessarily interfere with, and hinder, the market forces that drive development of high-performing, low-cost products that ultimately minimize total ecological impacts of coatings. To be effective, seasonal deregulation must restore the full range and variety of architectural coating products, and permit unfettered technological innovation to create more and better products. A labeling requirement, however, may be appropriate to ensure that manufacturers prominently label those coatings that would be restricted from sales and use during summer, to indicate their restricted status. Technological and economic feasibility of any regulation during ozone season is essential because seasonal deregulation cannot justify a general ban on painting during summer. Many architectural coatings have such marginal (if any) potential to impact ozone levels that their continued use should be allowed. Coatings that are typically used on large-scale, long-term new construction and maintenance projects—where the work of many trades is coordinated through a "critical path" schedule—must continue to be available during summer because painting operations on these projects cannot be interrupted or delayed without incurring extremely disruptive economic impacts. Also, an exemption for low-volume touch-up and repair work should be provided.

Rules implementing seasonal deregulation would need to keep administrative requirements to a minimum. Excessive and burdensome requirements for registration, recordkeeping, and reporting would render the seasonal approach entirely unattractive. Instead, monitoring and enforcement efforts should focus on manufacturers to ensure appropriate labeling of restricted products, and on distributors to ensure that restricted products are withdrawn from sale before the start of ozone season each year. Some survey work and analysis of sales statistics would help to quantify effectiveness of seasonal deregulation, so that resulting additional reductions during summer can be credited accordingly.

RECOMMENDATION: As one of the simplest yet potentially most effective innovative approaches discussed here, seasonal deregulation should be incorporated into existing architectural coating rules in the near term, limiting their operation to focus entirely on the summer ozone season as determined under local conditions.

F. REGIONAL DEREGULATION

CONCEPT: In some geographically distinct regions, environmental conditions are such that local VOC emissions have no potential to contribute significantly to ozone levels. These regions may also have severe climatic exposure conditions and narrow windows of opportunity for painting operations. Exempting architectural coatings from regulation in such regions would allow the best performing coatings to be applied at whatever time possible.

DISCUSSION: The United States is geographically and climatically diverse. California is similarly diverse, encompassing mountains, deserts, and seacoast areas that present demanding exposure conditions, (e.g., snow and ice, repeated freeze/thaw cycles, extreme diurnal and annual temperature variation, intense sunlight and heat, and corrosive saltwater and salt-laden moist air and fog). Special consideration should be given to the coating needs of these areas, where protection against the elements is generally more important than in average urban or suburban areas.

To the extent that high-exposure regions have no ozone problem, or man-made VOC emissions have no impact on ozone because of the prevalence of biogenic VOC, or low NO_x and high VOC/NO_x ratios, these regions should be exempted from architectural coating rules, even where such region falls within the jurisdiction of an agency with a rule in place. SCAQMD Rule 1113 again provides a limited precedent, as the rule currently exempts lacquers and semi-transparent stains used in the mountainous areas of the district at elevations of 4,000 feet or more above sea level. Conditions in these areas demand better performance than is possible with compliant products under current limits. Use of compliant products in the mountains has resulted in premature coating failures and more frequent recoating, at considerable expense to property owners. Also, CARB is now proposing to rescind the requirement for winter oxygenated fuels in those areas of the state where such fuels are no longer needed to reduce carbon monoxide levels.

desert + mountains

RECOMMENDATION: Review the areas subject to existing architectural coating rules, to identify those distinct geographic regions where severe climatic exposure conditions may occur and coating VOC emissions have no potential to impact ozone levels appreciably. Amend rules to exempt all architectural coatings used or sold for use in those regions.

G. PUBLIC ADVISORIES/VOLUNTARY ACTION

CONCEPT: Members of the general public who are commonly inclined to support action that improves environmental quality may lack adequate information to make appropriate choices or to modify personal behavior. Public advisories to promote informed decisionmaking and voluntary action can enhance and amplify the effectiveness of regulatory strategies far more efficiently than increasingly intrusive mandates.

DISCUSSION: Architectural coatings are both a consumer and commercial product, since they are applied by both professional painting contractors and members of the general public. In fact, as much as 60-70% of the volume of architectural coatings is applied to residential structures, mostly by homeowners and other "do-it-youselfers." Public information outreach to these amateur painters could be valuable in encouraging voluntary action, beyond what is required under regulation, to further reduce any potential ozone impact of VOC emissions from architectural coatings. Public media announcements, for example, might suggest deferring home painting projects out of the summer ozone season, or might specifically target anticipated high ozone days as part of a local air quality forecast, along with suggestions on curtailing other activities.

Information in print (e.g., newspaper and magazine articles, point-of-sale brochures, flyers and "fact-sheets") could provide more detail. In addition to suggesting appropriate timing of home projects, print messages should stress the importance of consulting a paint professional on product selection. To maximize the environmental benefits of painting, products must be matched to the performance requirements of the job at hand, weighing factors such as coverage, durability, appearance, ease of use and touch-up, number of coats, and length of time between recoats. Consumers may then be advised to select the lowest-VOC coating that will adequately meet specific performance needs. Advice from regulatory agencies, however, must not endorse specific products or product types, or specific manufacturers. Such endorsement (or even the appearance of endorsement) could result in unintended anti-competitive effects.

We expect that any public information on architectural coatings would be presented in the context of general information on air quality, to identify the full range of emission sources and their relative importance. This would foster an understanding of total emissions impacts related to a home project. For example, the consumer should be advised to make sure to pick up everything needed for the project in one shopping trip, since motor vehicle emissions—particularly from cold starts and short errands—are still the overwhelmingly primary source of air pollution.

RECOMMENDATION: Regulatory agencies should work with industry representatives to develop public information programs that can beneficially influence consumer choices and actions affecting air quality. Follow up with survey work to verify effectiveness.

III. SUMMARY & CONCLUSIONS

Although ground-level ozone persists as an air quality problem, considerable improvement has occurred over the past two decades with growth in the science and technology needed to understand and control ozone formation. Regulatory strategy for architectural coatings, however, has not kept pace—better strategies could be implemented through any or all of the innovative approaches described here. Some will require further development before implementation, while others are ready for near immediate application.

Exemption of low volatility compounds and seasonal deregulation could be incorporated into current rules almost immediately, and would greatly sharpen their focus. Some regional deregulation and limited aspects of reactivity-based standards and performance-based standards could be implemented in the near-term, although further investigations are necessary to support full implementation. Simplified product line averaging and public advisories/voluntary action would be appropriate for long-term development as discretionary options, to provide flexibility and enhance effectiveness.

Our hope is that all of these innovative approaches, as presented in this concept paper, will receive serious consideration and stimulate a substantive dialogue between air quality regulatory agencies and paint industry representatives. We look forward to working together to achieve our shared environmental and economic values.

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